River Mile 10.9 Removal Action Water Quality Monitoring: Proposed Monitoring During Capping Operations

PREPARED FOR:	de maximis, inc.
COPY TO:	File
PREPARED BY:	CH2M HILL
DATE:	October 30, 2013
PROJECT NUMBER:	474468.RA.PM.01

Summary

This technical memorandum presents a summary of the surface water samples collected as part of the EPA-approved *River Mile 10.9 Removal Action Water Quality Monitoring Plan, Lower Passaic River Study Area*, dated July 31, 2013 (the "WQMP"). The WQMP details appropriate management measures and monitoring for the protection of the existing water quality in the Lower Passaic River during dredging and capping operations conducted as part of the River Mile (RM) 10.9 Removal Action (Removal Action).

As discussed herein, results from the water quality data received to date indicate that RM 10.9 dredging operations were not a source of chemicals of potential concern (COPC) to the water column. Therefore, CH2M HILL proposes a reduction in the water quality monitoring program during the upcoming capping operations, which have significantly less potential to disturb sediments as compared to the dredging operations.

This technical memorandum documents the results of surface water samples collected prior to (historic and pre-dredge baseline) and during dredging operations. Based on these data and the best management practice (BMP) proposed for the capping operations, CH2M HILL recommends a discontinuation of COPC sampling during capping as the necessary water quality monitoring can be achieved through real-time turbidity monitoring.

Introduction

Evaluation of impacts to water quality during the dredging and capping operations requires an understanding of the ambient conditions in the area prior to the Removal Action and of natural variability in the monitoring parameters. Since 2009, there have been two extensive surface water data collection programs: the 2009-2010 Physical Water Column Monitoring program and the 2011-2013 Small Volume Chemical Water Column Monitoring program, which were conducted as part of the Lower Passaic River Study Area (LPRSA) Remedial Investigation/Feasibility Study (RI/FS). These programs generated samples that were collected from RM 10.2 (adjacent to Turbidity Buoy/Transect #1) and analyzed for constituents analogous to those characterized during the dredging operations including 2,3,7,8–tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), mercury, and total polychlorinated biphenyl (PCB) congeners.

One of the objectives of the dredging monitoring program was to quantify select COPC levels in the water column to determine if dredging resulted in increased COPC concentrations. Statistical comparisons (ANOVA and t-test) were conducted to determine if differences existed among the data collected as part of the historic, pre-dredge baseline, and dredging sampling programs. The results, which are presented in the next section, show that there were no statistically significant differences in COPC concentrations between pre-dredge samples and samples collected during dredging operations. In addition, no statistically significant differences were found among the four "synoptic" composite transect samples, which were collected at least weekly during dredging operations from four fixed locations upstream and downstream of the Removal Area.

Monitoring Overview

Turbidity monitoring buoys were installed to record real-time measurements of turbidity. These data were used to establish average non-dredging baseline conditions, measure ambient turbidity upstream and downstream of the Removal Area, and monitor for elevated turbidity associated with the dredging and capping operations. The locations of the buoys are shown on Figure 1 and summarized below:

- Fixed Turbidity Buoy #1: Downstream "ambient" location at RM 10.2, approximately 0.5 miles (2,650 ft.) downstream of the Removal Area's southern perimeter boundary
- Fixed Turbidity Buoy #2: Downstream location approximately 200 ft. downstream of the RM 10.9 Removal Area's southern perimeter boundary
- Fixed Turbidity Buoy #3: Upstream location approximately 200 ft. upstream of the RM 10.9 Removal Area's northern perimeter boundary
- Fixed Turbidity Buoy #4: Upstream "ambient" location at RM 11.7, approximately 0.5 miles (2,650 ft.) upstream of the Removal Area's northern perimeter boundary

In addition to the real-time turbidity measurements, additional samples were collected for COPC analysis at the direction of USEPA and NJDEP. The COPC sampling events performed as part of the WQMP included collection of a composite sample at each of the four fixed buoy locations. The WQMP monitoring events included:

- Pre-dredge baseline monitoring
- Initial dredging monitoring
- Weekly resuspension monitoring
- Event-based sampling (event based sampling was not performed during the dredging operations as no trigger or action levels were exceeded)

RM 10.9 Surface Water Analytical Results

A total of 56 historic ambient, 11 pre-dredge baseline, and 31 dredging monitoring samples were collected and analysed for similar COPCs. The 31 dredging monitoring samples represent all but the last 4 composite samples collected the final week of dredging (analytical results have not yet been received). These data are presented in Figures 2, 3, and 4, for total PCBs, 2,3,7,8-TCDD, and total mercury, respectively. These data are also presented in tabular form in Appendix A.

A simple visual comparison of the data presented in Figures 2, 3, and 4 indicates that the dredging data were consistently within or below the range of historic pre-dredge ambient concentrations measured from 2011 to 2013 for all three COPCs. A similar evaluation was done among the four transect locations during dredging and indicates similar concentrations at all four transaction locations positioned both upstream and downstream of the dredging operations; see Figures 5, 6, 7, for total PCBs, 2,3,7,8-TCDD, and total mercury, respectively. These results support the conclusion that the dredging operations did not cause elevations in average ambient COPC surface water concentrations.

Statistical Evaluation of Data

The following statistical comparisons were conducted to further evaluate the conclusion that dredging operations had no impact on water quality: (1) t-test comparisons between pre-dredge baseline and dredging samples, (2) ANOVA comparisons among all three sampling events, and (3) ANOVA comparisons among transect locations sampled during dredging. Statistical analyses were performed using the Microsoft Excel add-on software Analyse-it Version 2.26. Non-detect values were set at the detection limit.

The t-test and ANOVA are statistical methods to test for differences in the means of two (t-test) or more (ANOVA) datasets. In summary, if two means do not differ by a statistically significant amount, then there is no substantial difference between the means of the two datasets. These methods were used to test the null hypothesis (H_o) that there was no difference between/among the means of the given datasets. If H_o is rejected, the data are statistically different within a known level of confidence (e.g., 95%). For the 95% confidence interval, testing against values within this interval will lead to $p > 0.05$ (i.e., the H_o is accepted or no statistically significant difference). Testing against values outside the 95% confidence interval will lead to p-values < 0.05 (i.e., the H_o is rejected and the data are statistically different at the given level).

No statistically significant differences were found between the pre-dredge baseline samples and samples collected during dredging as indicated by p-values (called a 2-tailed p value in the t-test) greater than 0.05. The t-test results are presented for total PCBs, 2,3,7,8-TCDD, and total mercury, in Tables 1, 2, and 3, respectively. In addition, the ANOVA results show no statistically significant differences among Total PCB samples collected during dredging, historically at RM 10.2, and during the pre-dredge baseline event (Table 4). The ANOVA results for 2,3,7,8-TCDD (Table 5) and Mercury (Table 6) indicate that there were statistically significant differences between the historic and monitoring data (baseline and dredge), however, the historic data averages were statistically higher than the monitoring data in both cases. The final statistical comparison evaluated potential differences among the results for the four fixed transect locations. No statistically significant differences were found among the various upstream and downstream transect locations as shown in the ANOVA results presented in Tables 7, 8, and 9, for total PCBs, 2,3,7,8-TCDD, and total mercury, respectively.

Use of Silt Curtains During Capping

As discussed in the Capping Plan (GLDD, 10/21/2013), all capping activities will be conducted using acceptable BMPs to manage potential re-suspension during capping operations. The silt curtain systems will be flexible and adaptable to both the environmental conditions of the river as well as all activities associated with capping. The proposed silt curtains will be constructed of PVC sheeting that is weighted on the bottom and suspended from a flotation boom. The silt curtains will be deployed at an angle from the shore into the navigation channel to deflect currents around the capping zone and retain suspended solids within the capping zone. Figures showing the proposed configuration of the silt curtains are presented in Appendix B.

Conclusions and Recommendations

An extensive amount of data has been collected to characterize water quality during the RM 10.9 dredging operations. These data support the conclusion that dredging operations have not impacted water quality. Since the potential for sediment resuspension during capping operations is significantly lower than during dredging and silt curtains will be deployed during capping operations, CH2M Hill recommends that the CPG request EPA-approval to discontinue COPC sampling during capping. Water quality monitoring will continue, however, using the same real-time turbidity monitoring setup as used during the dredging monitoring.

Figures

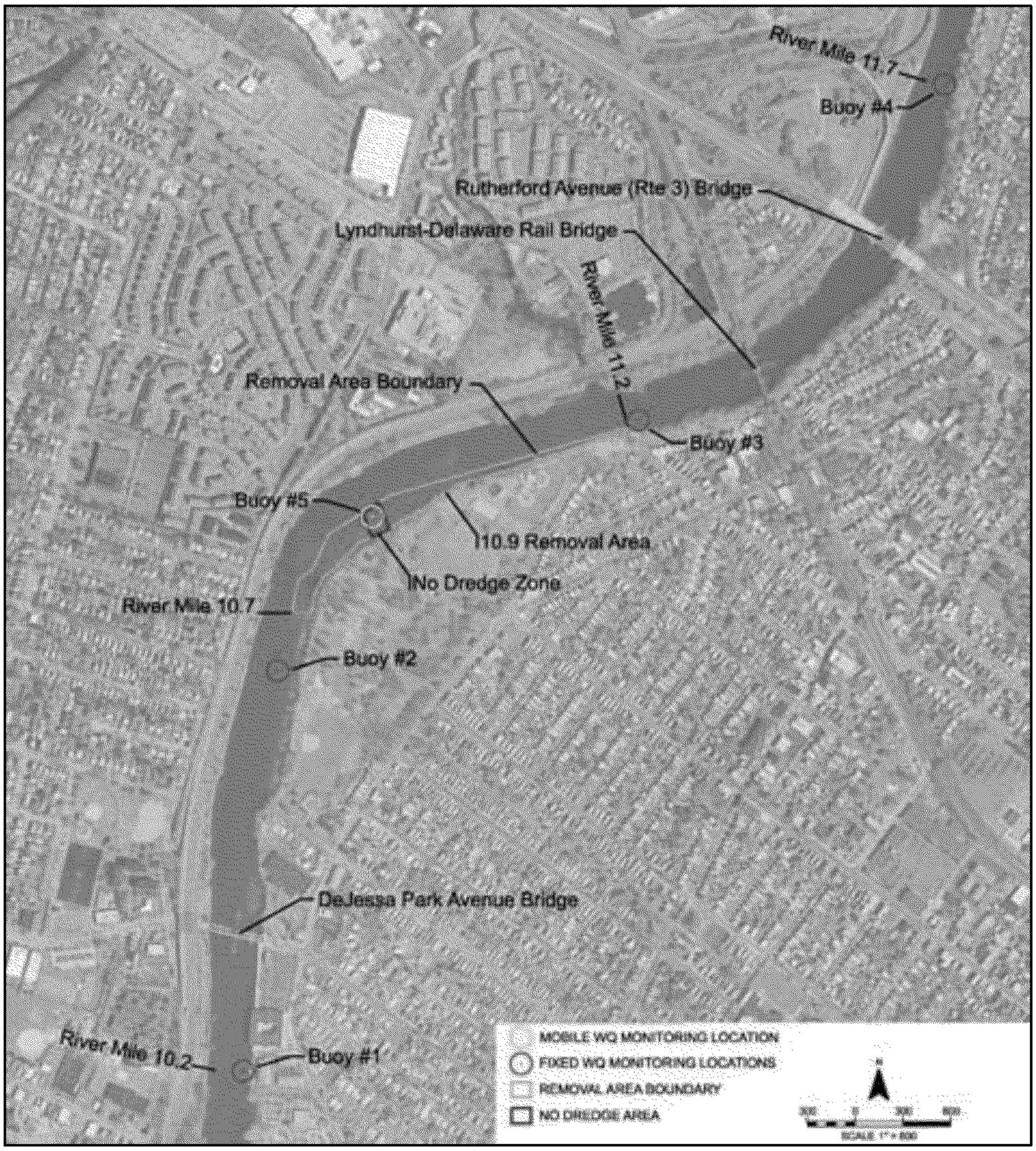


Figure 1. Water Quality Monitoring Locations

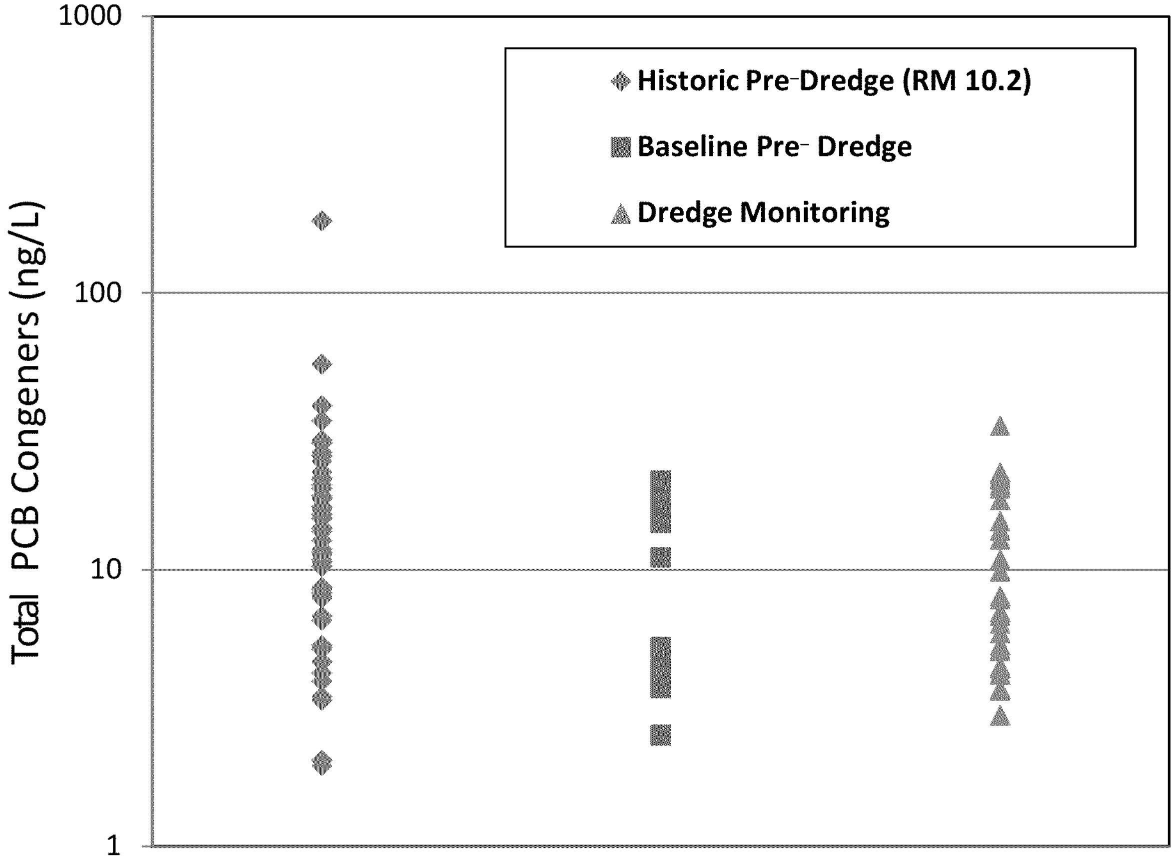


Figure 2. Summary of Total PCB Congener Concentrations in Historic Pre-Dredge, Baseline Pre-Dredge, and Dredging Monitoring Samples.

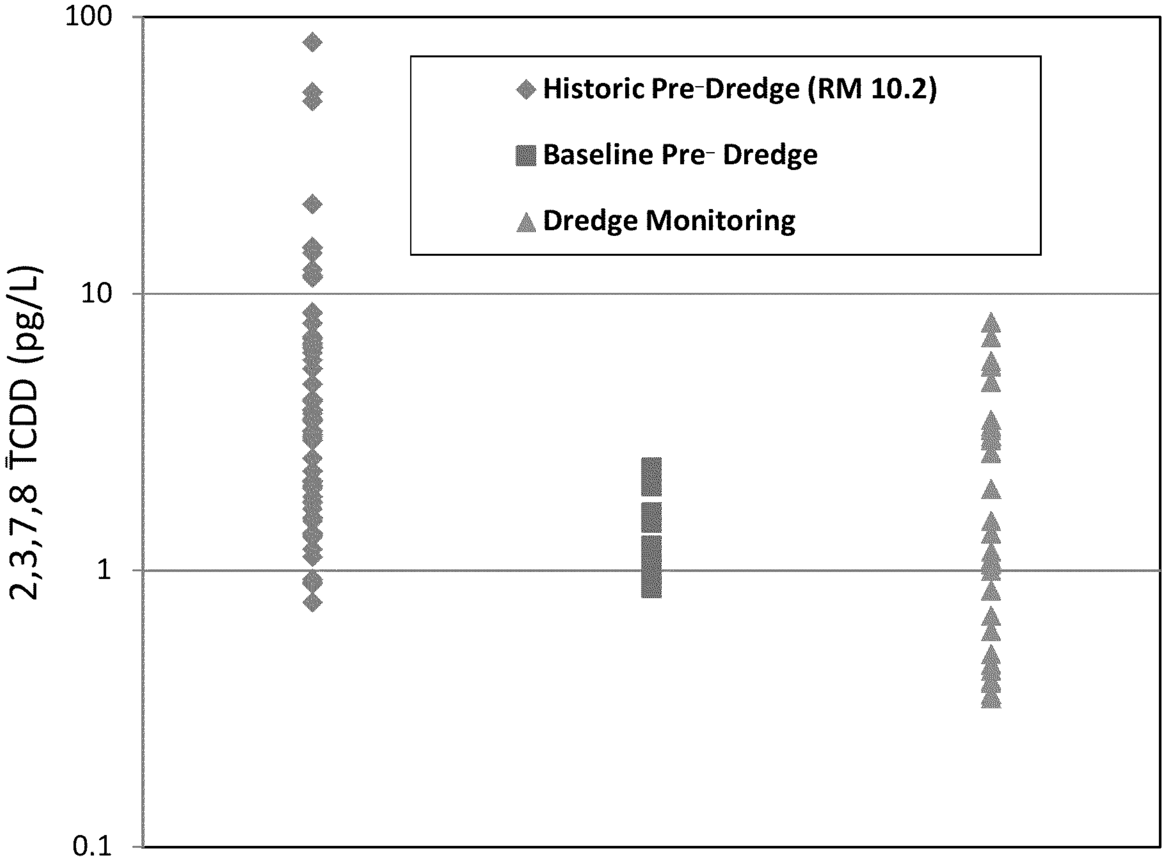


Figure 3. Summary of 2,3,7,8-TCDD Concentrations in Historic Pre-Dredge, Baseline Pre-Dredge, and Dredging Monitoring Samples.

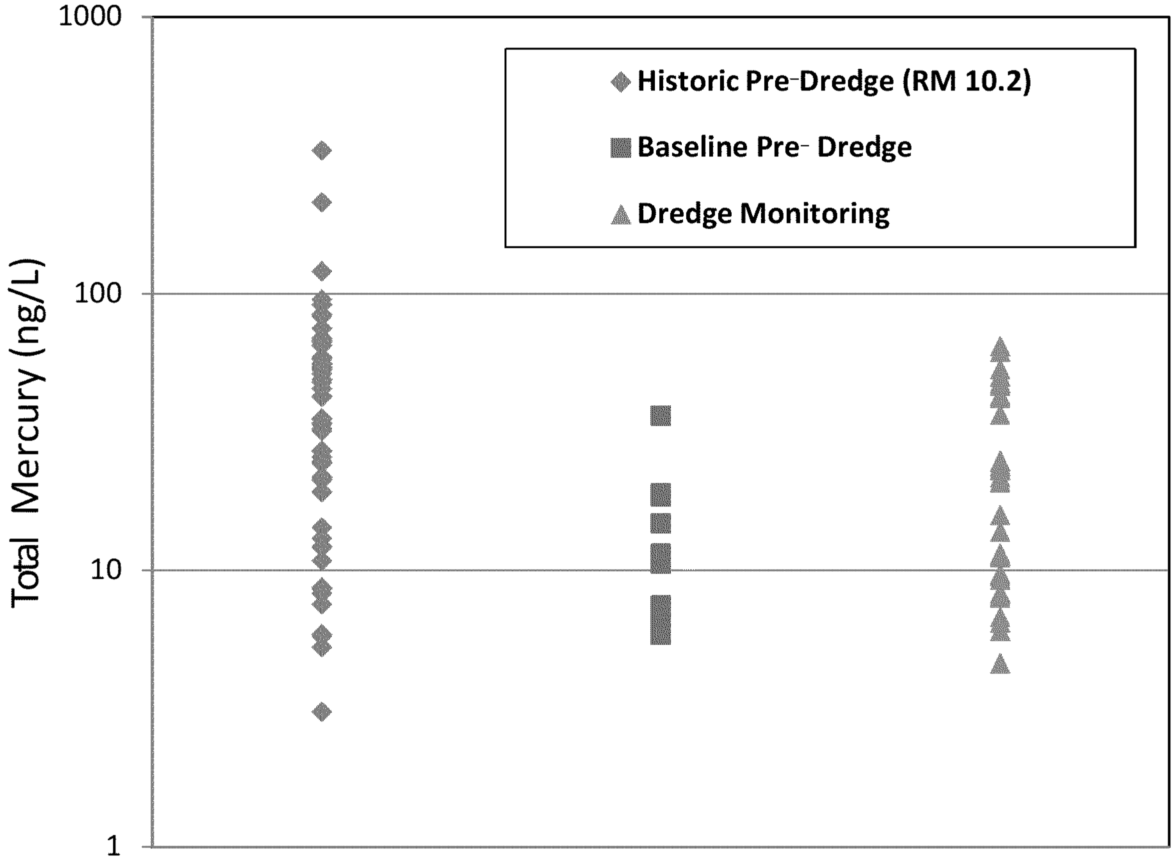


Figure 4. Summary of Total Mercury Concentrations in Historic Pre-Dredge, Baseline Pre-Dredge, and Dredging Monitoring Samples.

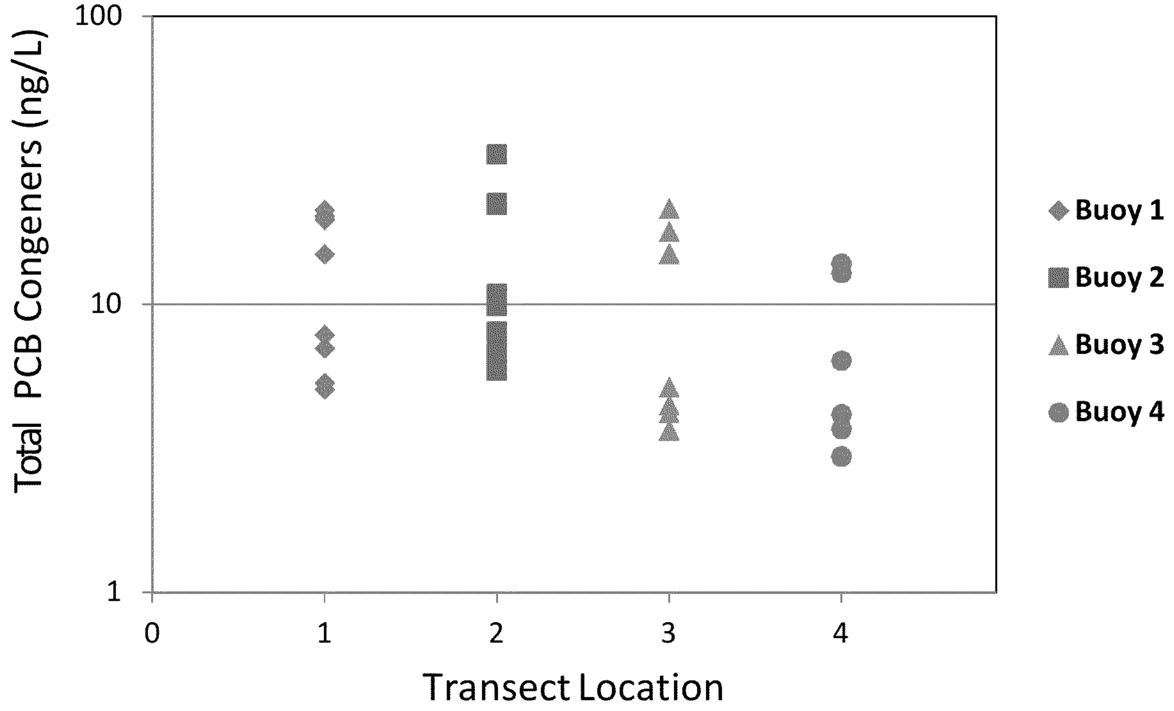


Figure 5. Summary of Total PCB Congener Concentrations at the Four Fixed Buoy/Transect Locations During Dredging

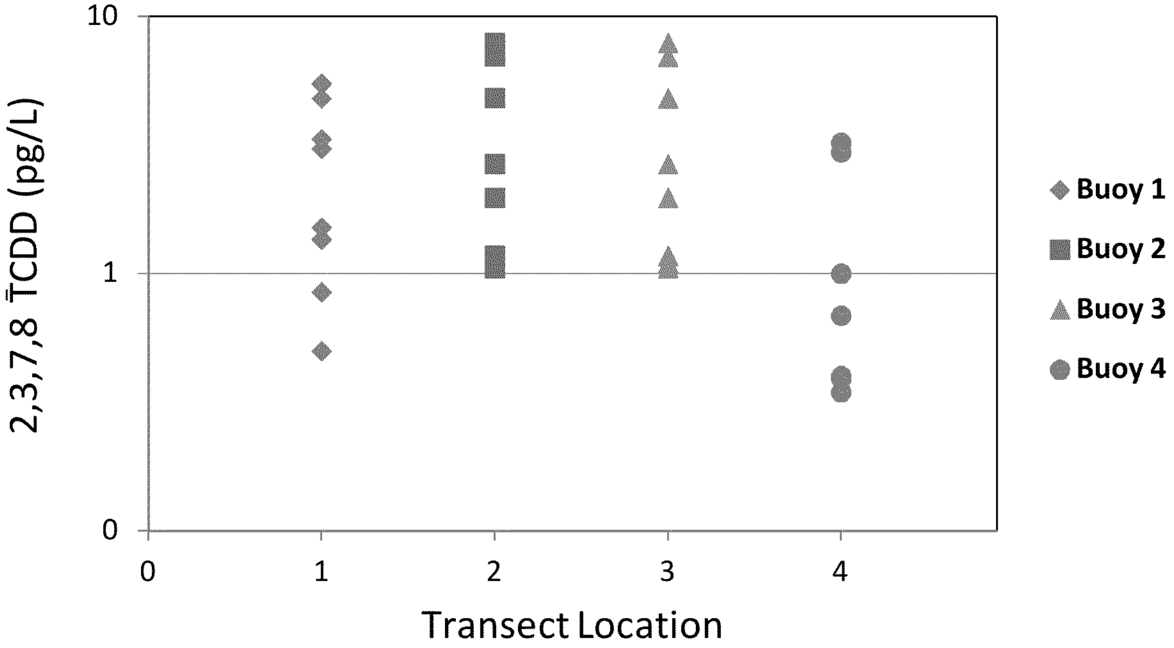


Figure 6. Summary of 2,3,7,8-TCDD Concentrations at the Four Fixed Buoy/Transect Locations During Dredging

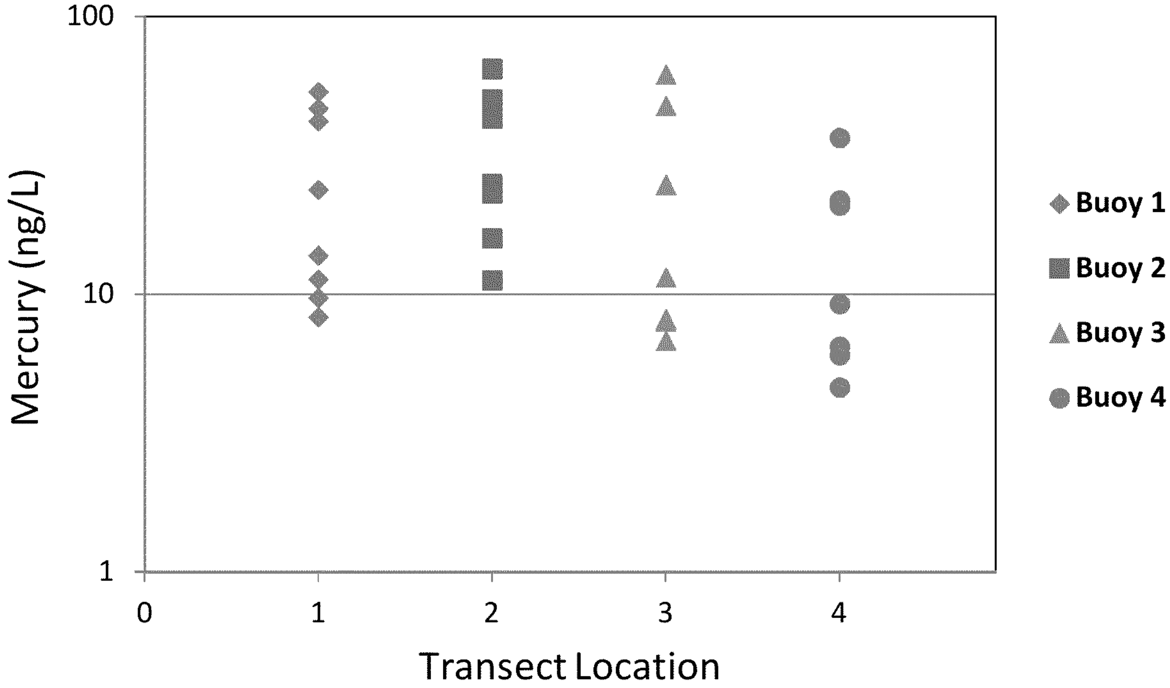


Figure 7. Summary of Total Mercury Concentrations at the Four Fixed Buoy/Transect Locations During Dredging

Tables

Table 1. Total PCB Congeners t-test Results

Analyse-it v2.26

Test	**Compare Groups - Independent t-test** Alternate Hypothesis Total PCB Congeners (ng/L): Baseline Pre- Dredge ≠ Dredge Monitoring

n	42

Total PCB Congeners (ng/L)	n	Mean	SE	SD
Baseline Pre- Dredge	11	10.656	1.9985	6.628
Dredge Monitoring	31	11.112	1.4050	7.823

Mean difference	-0.455
95% CI	-5.805 to 4.894
SE	2.6468

t statistic	-0.17
DF	40.0
2-tailed p	0.8643

Table 2. 2,3,7,8-TCDD t-test Results

Analyse-it v2.26

Test	**Compare Groups - Independent t-test**
	Alternate Hypothesis
	2,3,7,8-TCDD (pg/L): Baseline Pre- Dredge ≠ Dredge Monitoring

n	42

2,3,7,8-TCDD(pg/L)	n	Mean	SE	SD
Baseline Pre- Dredge	11	1.4445	0.15008	0.4977
Dredge Monitoring	31	2.3558	0.38059	2.1190

Mean difference	-0.9114
95% CI	-2.2249 to 0.4022
SE	0.64994

t statistic	-1.40
DF	40.0
2-tailed p	0.1686

Table 3. Total Mercury t-test Results Between Baseline Pre-Dredge and Dredge Monitoring

Analyse-it v2.26

Test	Compare Groups - Independent t-test
	Alternate Hypothesis
	Total Mercury(ng/L): Baseline Pre- Dredge ≠ Dredge Monitoring

n	42

Total Mercury (ng/L)	n	Mean	SE	SD
Baseline Pre- Dredge	11	13.224	2.7082	8.982
Dredge Monitoring	31	24.164	3.2635	18.170

Mean difference	-10.940
95% CI	-22.547 to 0.667
SE	5.7430

t statistic	-1.90
DF	40.0
2-tailed p	0.0640

Table 4. Total PCB Congeners ANOVA Results for Historic Pre-Dredge (RM 10.2), Baseline Pre-Dredge, and Dredge Monitoring

Analyse-it v2.26

Test	**Compare Groups - 1-way ANOVA**
	Total PCB Congeners (ng/L): Historic Pre-Dredge (RM 10.2), Baseline Pre- Dredge, Dredge Monitoring

n	98

Total PCB Congeners (ng/L)	n	Mean	SE	Pooled SE	SD
Historic Pre-Dredge	56	18.757	3.2839	2.5829	24.575
Baseline Pre- Dredge	11	10.656	1.9985	5.8277	6.628
Dredge Monitoring	31	11.112	1.4050	3.4715	7.823

Source of variation	Sum squares	DF	Mean square	F statistic	p
Total PCB Congeners (ng/L)	1448.679	2	724.340	1.94	0.1495
Residual	35490.495	95	373.584		
Total	36939.175	97			

Table 5. 2,3,7,8-TCDD ANOVA Results for Historic Pre-Dredge (RM 10.2), Baseline Pre-Dredge, and Dredge Monitoring

Analyse-it v2.26

Test: Compare Groups - 1-way ANOVA

2,3,7,8-TCDD (pg/L): Historic Pre-Dredge (RM 10.2), Baseline Pre- Dredge, Dredge Monitoring

n	98

2,3,7,8-TCDD (pg/L)	n	Mean	SE	Pooled SE	SD
Historic Pre-Dredge	56	7.8195	1.86870	1.43091	13.9841
Baseline Pre- Dredge	11	1.4445	0.15008	3.22857	0.4977
Dredge Monitoring	31	2.3558	0.38059	1.92320	2.1190

Source of variation	Sum squares	DF	Mean square	F statistic	p
2,3,7,8-TCDD (pg/L)	787.1647	2	393.5824	3.43	0.0364
Residual	10892.7162	95	114.6602		
Total	11679.8809	97			

Table 6. Total Mercury ANOVA Results for Historic Pre-Dredge (RM 10.2), Baseline Pre-Dredge, and Dredge Monitoring

Analyse-it v2.26

Test	Compare Groups - 1-way ANOVA
	Total Mercury (ng/L): Historic Pre-Dredge (RM 10.2), Baseline Pre-Dredge, Dredge Monitoring

n	98

Total Mercury (ng/L)	n	Mean	SE	Pooled SE	SD
Historic Pre-Dredge	56	49.088	6.9660	5.4870	52.129
Baseline Pre-Dredge	11	13.224	2.7082	12.3803	8.982
Dredge Monitoring	31	24.164	3.2635	7.3748	18.170

Source of variation	Sum squares	DF	Mean square	F statistic	p
Total Mercury (ng/L)	19506.101	2	9753.050	5.78	0.0043
Residual	160169.560	95	1685.995		
Total	179675.660	97			

Table 7. Total PCB Congeners ANOVA Results the Four Fixed Buoy/Transect Locations During Dredging

Analyse-it v2.26

Test	Compare Groups - 1-way ANOVA
	Groups: PCB-1, PCB-2, PCB-3, PCB-4

n	30

Groups	n	Mean	SE	Pooled SE	SD
PCB-1	8	12.7050	2.51225	2.69778	7.1057
PCB-2	8	14.9338	3.48480	2.69778	9.8565
PCB-3	7	10.2714	2.87382	2.88404	7.6034
PCB-4	7	6.7186	1.78259	2.88404	4.7163

Source of variation	Sum squares	DF	Mean square	F statistic	p
Groups	275.7214	3	91.9071	1.58	0.2185
Residual	1513.8242	26	58.2240		
Total	1789.5455	29			

Table 8. 2,3,7,8-TCDD ANOVA Results the Four Fixed Buoy/Transect Locations During Dredging

Analyse-it v2.26

Test: Compare Groups - 1-way ANOVA

Groups: TCDD-1, TCDD-2, TCDD-3, TCDD-4

n: 30

Groups	n	Mean	SE	Pooled SE	SD
TCDD-1	8	2.6123	0.65638	0.73588	1.8565
TCDD-2	8	3.4550	0.97563	0.73588	2.7595
TCDD-3	7	2.1443	0.78195	0.78669	2.0689
TCDD-4	7	1.2893	0.47618	0.78669	1.2599

Source of variation	Sum squares	DF	Mean square	F statistic	p
Groups	18.3472	3	6.1157	1.41	0.2618
Residual	112.6350	26	4.3321		
Total	130.9821	29			

Table 9. Total Mercury ANOVA Results the Four Fixed Buoy/Transect Locations During Dredging

Analyse-it v2.26

Test	Compare Groups - 1-way ANOVA
	Groups: Hg-1, Hg-2, Hg-3, Hg-4

n	30

Groups	n	Mean	SE	Pooled SE	SD
Hg-1	8	26.1375	6.53206	6.42687	18.4754
Hg-2	8	32.0250	6.56508	6.42687	18.5688
Hg-3	7	24.0714	8.37681	6.87061	22.1630
Hg-4	7	15.0986	4.47524	6.87061	11.8404

Source of variation	Sum squares	DF	Mean square	F statistic	p
Groups	1093.7780	3	364.5927	1.10	0.3656
Residual	8591.3567	26	330.4368		
Total	9685.1347	29			

Appendix A – Analytical Data

Table A1. Historic Pre-Dredge Monitoring Data from River Mile 10.2

Sample Location	Sample Collection Date	2,3,7,8-TCDD	Total PCBs	Mercury (Total)
		pg/L	ng/L	ng/L
11A-CE01-T102-BS	8/16/2011	5.38	22.6	91.5
11A-CE01-T102-AS	8/16/2011	2.96 Z	15.4	51.5
11A-CE02-T102-BS	8/16/2011	6.54	16.5	3.09
11A-CE02-T102-AS	8/16/2011	3.71 Z	8.67	27.2
11A-CE03-T102-BS	8/16/2011	4.1 J	11.4	33.9
11A-CE03-T102-AS	8/16/2011	3.2 Z	7.91	32
11A-CE04-T102-BS	8/16/2011	6.92	25.8	84.6
11A-CE04-T102-AS	8/16/2011	5.78	20.3	69.3
12B-CE02-T102-BS	2/20/2012	1.51 Z	3.5	8.29
12B-CE02-T102-AS	2/20/2012	1.33 Z	4.24	8.7
12B-CE03-T102-BS	2/20/2012	3.1 J	6.58	21.3
12B-CE03-T102-AS	2/20/2012	1.37 Z	5.26	12.2
12B-CE04-T102-BS	2/20/2012	1.36 Z	4.67	14.3
12B-CE04-T102-AS	2/20/2012	1.12 Z	3.39	10.9
12B-CE01-T102-BS	2/20/2012	0.91 U	2.05	5.31
12B-CE01-T102-AS	2/20/2012	0.896 U	1.96	5.89
12D-CE04-T102-BS	3/26/2012	3.05 Z	18.2	48
12D-CE04-T102-AS	3/26/2012	3.03 J	15.9	67.2
12D-CE01-T102-BS	3/26/2012	4.73 J	8.24	32.6
12D-CE01-T102-AS	3/26/2012	2.1 Z	8.02	25.8
12D-CE02-T102-BS	3/26/2012	3.48	29.4	121
12D-CE02-T102-AS	3/26/2012	1.55 U	17	58.9
12D-CE03-T102-BS	3/26/2012	3.79 Z	11.6	34.2
12D-CE03-T102-AS	3/26/2012	3.82 Z	10.7	58.8
12F-CE01-T102-BS	6/4/2012	6.4	16.8	65.3
12F-CE01-T102-AS	6/4/2012	4.15 J	18.1	49.2
12F-CE02-T102-BS	6/4/2012	14.1	28.9	95.7
12F-CE02-T102-AS	6/4/2012	11.7	18.2	83.2
12F-CE03-T102-BS	6/4/2012	6.99	18.1	54.5
12F-CE03-T102-AS	6/4/2012	6.12	13.8	42.6

12F-CE04-T102-BS	6/4/2012	6.65	19.7	53.2
12F-CE04-T102-AS	6/4/2012	11.5	18.3	55.9
12G-CE01-T102-BS	8/30/2012	1.2 Z	26.7	75.3
12G-CE01-T102-AS	8/30/2012	7.84	28.7	67.3
12G-CE02-T102-BS	8/30/2012	49.8	183	330
12G-CE02-T102-AS	8/30/2012	14.8	55.5	214
12G-CE03-T102-BS	8/30/2012	1.99 J	18.6	67.9
12G-CE03-T102-AS	8/30/2012	2.02 J	15.3	32.1
12G-CE04-T102-BS	8/30/2012	81.3	25.8	45.6
12G-CE04-T102-AS	8/30/2012	21.1	39.2	53.9
12H-CE03-T102-BS	12/10/2012	3.54 Z	11.9	24.8
12H-CE03-T102-AS	12/10/2012	2.55 Z	10.9	19.3
12H-CE04-T102-BS	12/10/2012	8.58 Z	21.5	35.4
12H-CE04-T102-AS	12/10/2012	12.3	21.2	56.1
12H-CE01-T102-BS	12/10/2012	3.19 J	12.8	35.5
12H-CE01-T102-AS	12/10/2012	1.34 J	8.6	21.7
12H-CE02-T102-BS	12/10/2012	14.7	34.6	65.2
12H-CE02-T102-AS	12/10/2012	53.7	25.9	58.2
12C-CE11-T102-BS	2/27/2013	1.77	10.3	13.1
12C-CE11-T102-AS	2/27/2013	3.2	24.7	27
12C-CE12-T102-BS	2/27/2013	1.67 U	5.4	12.2
12C-CE12-T102-AS	2/27/2013	0.767 U	5.2	8.6
12C-CE20-T102-BS	2/28/2013	2.12	6.8	24.5
12C-CE20-T102-AS	2/28/2013	2.29	8.5	21.8
12C-CE21-T102-BS	3/4/2013	1.85 U	14.2	7.57
12C-CE21-T102-AS	3/4/2013	0.931 U	4.0	5.79

Key: Sample ID Nomenclature

11A, 12B, etc	2 Digit Year and Sampling Program
CD11, CD12, etc	Sampling Event with a Given Sampling Program
T102	River Mile 10.2
AS, BS	“A” for first (uppermost) depth interval, “B” for lower depth

Notes:

U = Analyte not detected above the reported sample quantitation limit.

J = Estimated result. Result is less than the reporting limit.

Z = Estimated maximum possible concentration (EMPC)

Table A2. Pre-Dredge Baseline Monitoring Data

Sample Location	Sample Collection Date	2,3,7,8-TCDD	Total PCBs	Mercury (Total)
		pg/L	ng/L	ng/L
CSW-1-130624-H	6/24/2013	1.05 J	5.2	10.6
CSW-1-130625-F	6/25/2013	2.03 U	21.0	7.34
CSW-2-130624-H	6/24/2013	2.35 U	4.4	18.6
CSW-2-130624-H-FD	6/24/2013	0.867 U	5.2	11.5
CSW-2-130625-E	6/25/2013	1.62 U	17.9	14.8
CSW-2-130625-F	6/25/2013	0.992 U	16.2	6.82
CSW-3-130624-H	6/24/2013	1.13 U	3.7	7.47
CSW-3-130625-E	6/25/2013	1.49 U	11.1	5.85
CSW-3-130625-F	6/25/2013	1.11 U	15.1	7.18
CSW-4-130624-H	6/24/2013	2.02 U	2.5	36.3
CSW-4-130625-E	6/25/2013	1.23 U	14.8	19

Key: Sample ID Nomenclature

CSW	Composite surface water sample
1, 2, 3, or 4	Fixed Buoy Monitoring Location
130620	Collection date (June 20, 2013)
E, H, or F	Ebb (E), high slack (H), or flood (F) tide period
FD	Field Duplicate

Notes:

U = Analyte not detected above the reported sample quantitation limit.

J = Estimated result. Result is less than the reporting lir

Table A3. Dredge Monitoring Data

Sample Location	Sample Collection Date	2,3,7,8-TCDD	Total PCBs	Mercury (Total)
		pg/L	ng/L	ng/L
CSW-1-130803	8/3/2013	1.36 J	7.05 Z	9.72
CSW-1-130805	8/5/2013	1.51 J	7.86 Z	13.8
CSW-1-130809-L	8/9/2013	0.5 Z	5.09 Z	8.28
CSW-1-130812-L	8/12/2013	0.848 Z	5.34 Z	11.3
CSW-1-130820-H	8/20/2013	3.06	20.3 Z	53.5
CSW-1-130827-H	8/27/2013	5.48	21.3	46.7
CSW-1-130903-L	9/3/2013	3.33 Z	15	23.8
CSW-1-130925-H	9/25/2013	4.81	19.7	42
CSW-2-130803	8/3/2013	2.67	10.9 Z	15.9
CSW-2-130805	8/5/2013	1.05 J	5.9 Z	11.2
CSW-2-130809-L	8/9/2013	1.17 Z	8.04 Z	24.9
CSW-2-130812-L	8/12/2013	1.1 Z	6.84 Z	23.3
CSW-2-130820-H	8/20/2013	6.98	22.2 Z	50.3
CSW-2-130827-H	8/27/2013	7.89	33.2	64.6
CSW-2-130903-L	9/3/2013	1.97 J	9.89	23.1
CSW-2-130925-H	9/25/2013	4.81 Z	22.5	42.9
CSW-3-130803	8/3/2013	1.06 J	4.47 Z	6.79
CSW-3-130805	8/5/2013	0.607 Z	5.16 Z	9.59
CSW-3-130805-FD	8/5/2013	0.457 Z	4.42 Z	11.5
CSW-3-130809-L	8/9/2013	0.358 U	3.66 Z	8
CSW-3-130813-L	8/13/2013	0.435 U	4.21 Z	8.11
CSW-3-130821-H	8/21/2013	5.72	15 Z	47.6
CSW-3-130828-H	8/28/2013	3.5	21.5	61.8
CSW-3-130925-H	9/25/2013	3.33	17.9	24.7
CSW-4-130803	8/3/2013	0.687 U	4.17 Z	4.62
CSW-4-130805	8/9/2013	0.4 U	3.71 Z	9.24
CSW-4-130809-L	8/13/2013	0.392 U	2.98 Z	6.04
CSW-4-130813-L	8/21/2013	0.346 U	2.97 Z	6.49
CSW-4-130821-H	8/28/2013	3.23	12.9 Z	36.6
CSW-4-130828-H	9/25/2013	1 Z	6.4	21.8
CSW-4-130925-H	8/28/2013	2.97	13.9	20.9

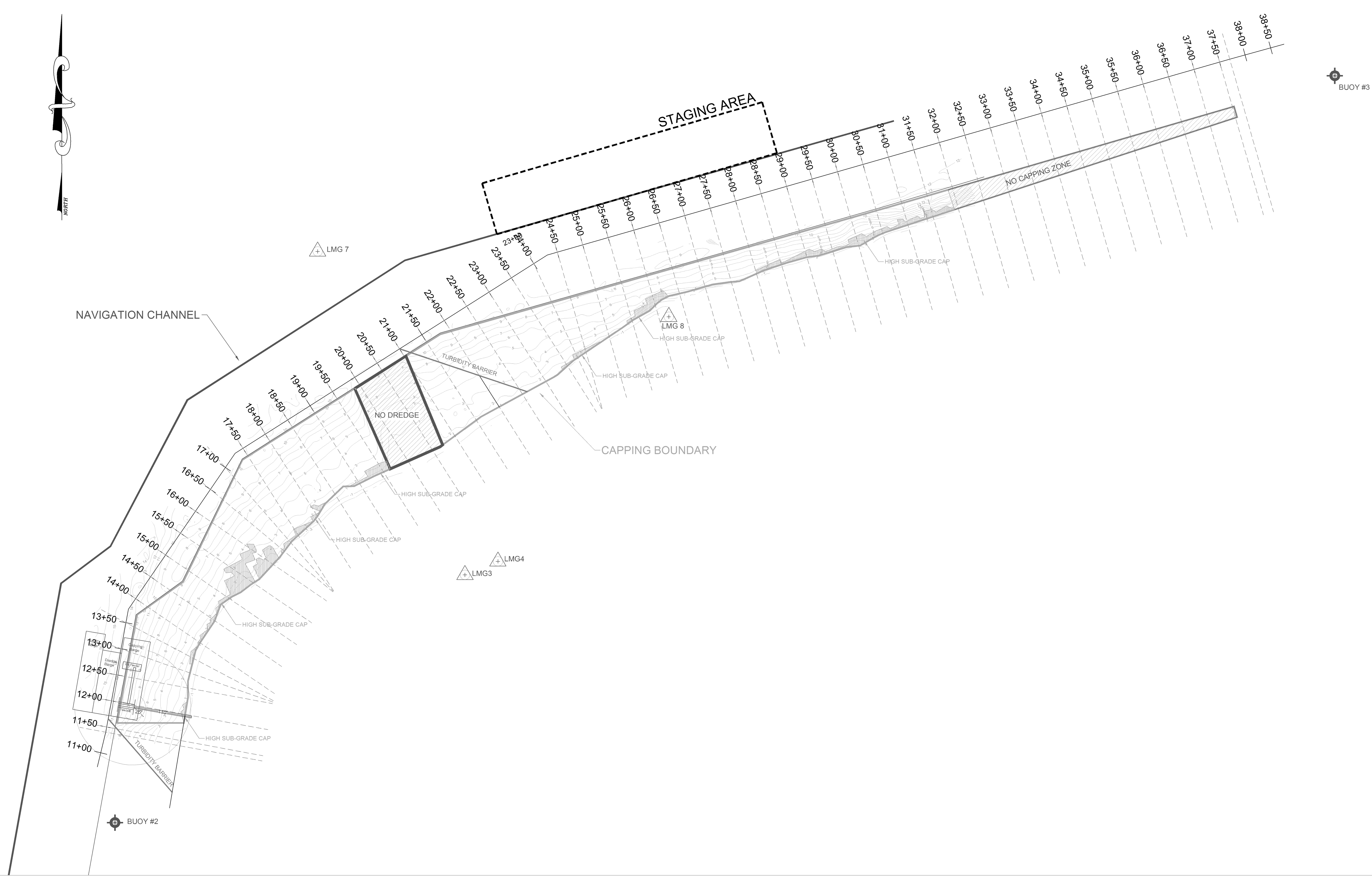
Key: Sample ID Nomenclature

CSW	Composite surface water sample
1, 2, 3, or 4	Fixed Buoy Monitoring Location
130620	Collection date (June 20, 2013)
E, H, or F	Ebb (E), high slack (H), or flood (F) tide period
FD	Field Duplicate

Notes:

U = Analyte not detected above the reported sample quantitation limit.
J = Estimated result. Result is less than the reporting limit.
Z = Estimated maximum possible concentration (EMPC)

Appendix B – Silt Curtains



NOTES:
1. DEPTH CONTOURS IN NGVD29
2. 0.00 MLW = -1.811 NGVD29 @ BELLEVILLE, NJ
3. HYDROGRAPHIC AND TOPOGRAPHIC DATA COLLECTED BY GLDD ON AUG 28- OCT 4

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

OPERATOR / CONDITIONS	
SURVEY DATE:	AUG 28 - OCT 4
ENGINEER / SURVEYOR:	JM, MP, CE
SURVEY VESSEL:	THE NEWARK BAY
VESSEL OPERATOR:	JC
WEATHER:	VARIES
TEMPERATURE:	VARIES
WIND:	VARIES
SEA:	0 FEET

ELECTRONIC EQUIPMENT	
FATHOMETER:	ODOM HYDROTRAC
FREQUENCY(s):	200 KHZ
HEAVE COMP.:	N/A
SOS (AVG):	VARIES
POSITIONING:	TRIMBLE 855 RTK
BASE LOCATION:	WBA.7
TIDE GAUGE:	N/A
	RTK TIDE USED

PROJECT DETAILS	
HORIZONTAL DATUM:	NAD83
LOCAL GRID:	NEW JERSEY
VERTICAL DATUM:	NGVD29
UNITS HORIZ. / VERT.:	US SURVEY FT
SURVEY/PROJ. CONTROL POINT:	X=
	Y=
	Z=
SURVEY/PROJ. BENCH MARK:	X=
	Y=
	Z=
TIDE STAFF LOCATION:	DEJESSA BRIDGE

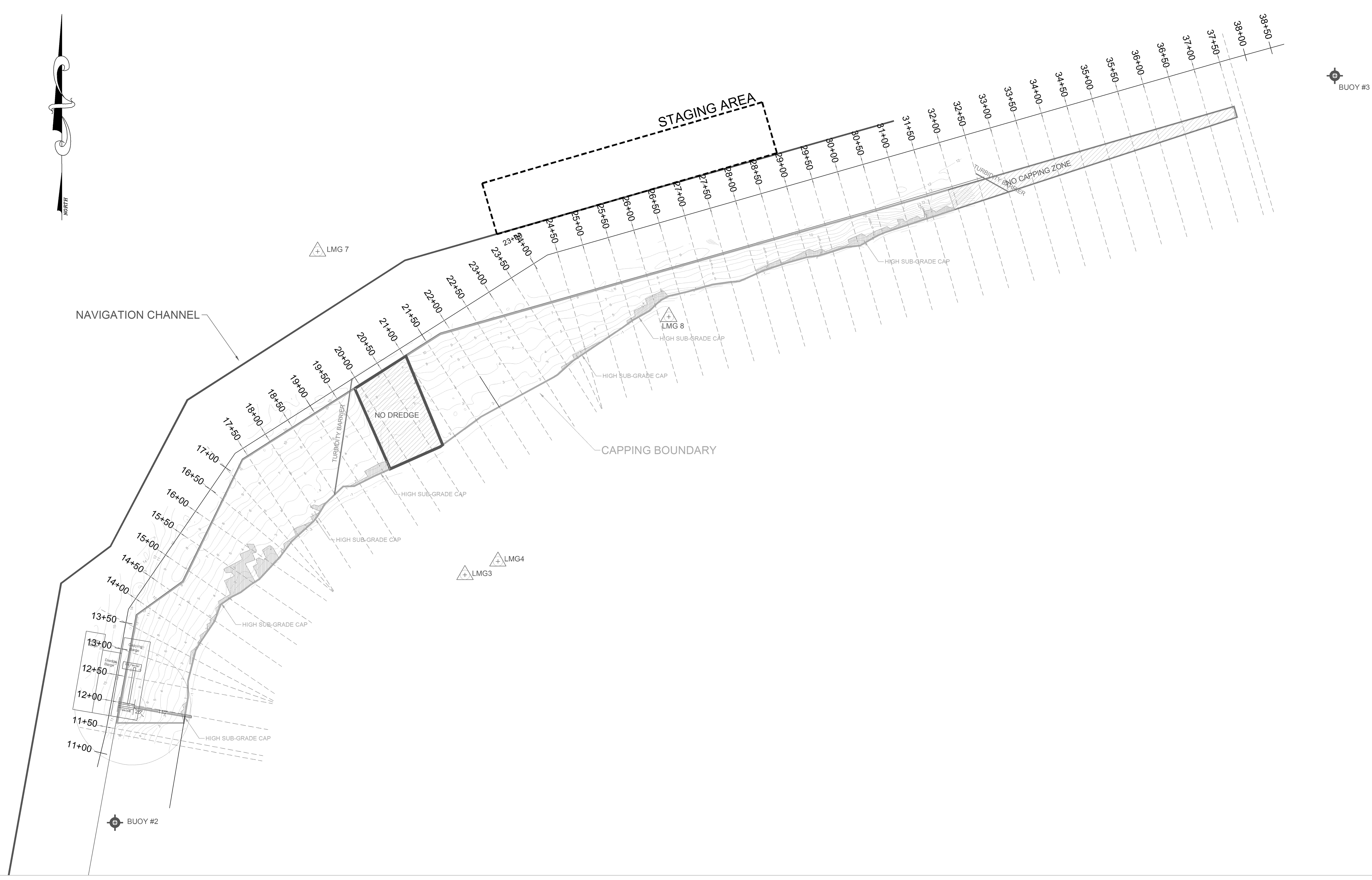
01

J. MILLER
J. MILLER
NA
15368
OCT. 21, 2013
1:80

PROJECT
LOWER PASSAIC RIVER, NJ
STUDY AREA PROJECT, RIVER MILE 10.9

TITLE/SURVEY TITLE
ATT. 2.0-CAPPING LAYOUT-SOUTH NO DREDGE

GREAT LAKES DREDGE AND DOCK COMPANY, LLC
2122 York Road Oak Brook IL 60521
Phone: 630 574-3000 Fax: 630 574-1515



NOTES:
1. DEPTH CONTOURS IN NGVD29
2. 0.00 MLW = -1.811 NGVD29 @ BELLEVILLE, NJ
3. HYDROGRAPHIC AND TOPOGRAPHIC DATA COLLECTED BY GLDD ON AUG 28- OCT 4

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

PROJECT
LOWER PASSAIC RIVER, NJ
STUDY AREA PROJECT, RIVER MILE 10.9

TITLE/SURVEY TITLE
ATT. 2.0-CAPPING LAYOUT-NORTH NO DREDGE

J. MILLER
J. MILLER
NA
15368
OCT. 21, 2013
1:80

01

GREAT LAKES DREDGE AND DOCK COMPANY, LLC
2122 York Road Oak Brook IL 60521
Phone: 630 574-3000 Fax: 630 574-1515

FOIA_07123_0002302_0031